

# SEQUENCE LISTING

<110> Malvar, Thomas  
Gilmer, Amy Jelen

<120> Polynucleotide Compositions Encoding Broad Spectrum  
delta-Endotoxins

<130> 11792.0215.DVUS02 MECO:215--2

<150> US 09/997,914

<151> 2001-11-30

<150> US 09/261,040

<151> 1999-03-02

<150> US 08/754,490

<151> 1996-11-20

<160> 30

<170> PatentIn version 3.2

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agt aac cct gaa gta gaa gta tta ggt gga gaa aga ata gaa act ggt  
Ser Asn Pro Glu Val Glu Val Leu Gly Gly Glu Arg Ile Glu Thr Gly  
20 25 30

96

tac acc cca atc gat att tcc ttg tgc cta acg caa ttt ctt ttg agt  
Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser  
35 40 45

144

gaa ttt gtt ccc ggt gct gga ttt gtg tta gga cta gtt gat ata ata  
Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile  
50 55 60

192

tgg gga att ttt ggt ccc tct caa tgg gac gca ttt ctt gta caa att  
Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile  
65 70 75 80

240

gaa cag tta att aac caa aga ata gaa gaa ttc gct agg aac caa gcc  
Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala  
85 90 95

288

att tct aga tta gaa gga cta agc aat ctt tat caa att tac gca gaa  
Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
100 105 110

336

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Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
115 120 125

384

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Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala	
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Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val	
145 150 155 160	
tat gtt caa gct gca aat tta cat tta tca gtt ttg aga gat gtt tca	528
Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser	
165 170 175	
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Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg	
180 185 190	
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Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp Tyr Ala Val	
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Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg	
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Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val	
225 230 235 240	
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Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro	
245 250 255	
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Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val	
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Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu	
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aga agt att agg agt cca cat ttg atg gat ata ctt aac agt ata acc	912
Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr	
290 295 300	
atc tat acg gat gct cat agg ggt tat tat tat tgg tca ggg cat caa	960
Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln	
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Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro	
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cta tat gga act atg gga aat gca gct cca caa caa cgt att gtt gct	1056
Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala	
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ggg aca gaa ttt gct tat gga acc tcc tca aat ttg cca tcc gct gta Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val 385 390 395 400	1200
tac aga aaa agc gga acg gta gat tcg ctg gat gaa ata ccg cca cag Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln 405 410 415	1248
aat aac aac gtg cca cct agg caa gga ttt agt cat cga tta agc cat Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His 420 425 430	1296
gtt tca atg ttt cgt tca ggc ttt agt aat agt agt gta agt ata ata Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile 435 440 445	1344
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aca att gat ccg gag agg att act caa ata cca ttg gta aaa gca cat Thr Ile Asp Pro Glu Arg Ile Thr Gln Ile Pro Leu Val Lys Ala His 465 470 475 480	1440
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gga gat att ctt cga cga aca agt gga gga cca ttt gct tat act att Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile 500 505 510	1536
gtt aat ata aat ggg caa tta ccc caa agg tat cgt gca aga ata cgc Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg 515 520 525	1584
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cgg att ttt gct ggt caa ttt aac aaa aca atg gat acc ggt gac cca Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro 545 550 555 560	1680
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ttc cca atg agc cag agt agt ttc aca gta ggt gct gat act ttt agt Phe Pro Met Ser Gln Ser Ser Phe Thr Val Gly Ala Asp Thr Phe Ser 580 585 590	1776
tca ggg aat gaa gtt tat ata gac aga ttt gaa ttg att cca gtt act Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr 595 600 605	1824
gca aca ttt gaa gca gaa tat gat tta gaa aga gca caa aag gcg gtg Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val 610 615 620	1872
aat gcg ctg ttt act tct ata aac caa ata ggg ata aaa aca gat gtg Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val 625 630 635 640	1920
acg gat tat cat att gat caa gta tcc aat tta gtg gat tgt tta tca Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser 645 650 655	1968
gat gaa ttt tgt ctg gat gaa aag cga gaa ttg tcc gag aaa gtc aaa Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys 660 665 670	2016
cat gcg aag cga ctc agt gat gag cgg aat tta ctt caa gat cca aac His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn 675 680 685	2064
ttc aaa ggc atc aat agg caa cta gac cgt ggt tgg aga gga agt acg Phe Lys Gly Ile Asn Arg Gln Leu Asp Arg Gly Trp Arg Gly Ser Thr 690 695 700	2112
gat att acc atc caa aga gga gat gac gta ttc aaa gaa aat tat gtc Asp Ile Thr Ile Gln Arg Gly Asp Asp Val Phe Lys Glu Asn Tyr Val 705 710 715 720	2160
aca cta cca ggt acc ttt gat gag tgc tat cca aca tat ttg tat caa Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln 725 730 735	2208
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Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser  
35 40 45

Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile  
50 55 60

Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile  
65 70 75 80

Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala  
85 90 95

Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
100 105 110

Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
115 120 125

Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala  
130 135 140

Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val  
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Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser  
165 170 175

Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg  
180 185 190

Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp Tyr Ala Val  
195 200 205

Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg  
210 215 220

Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val  
225 230 235 240

Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro  
245 250 255

Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val  
260 265 270

Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu  
275 280 285

Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr  
290 295 300

Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Trp Ser Gly His Gln  
305 310 315 320

Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro  
325 330 335

Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala  
340 345 350

Gln Leu Gly Gln Gly Val Tyr Arg Thr Leu Ser Ser Thr Leu Tyr Arg  
355 360 365

Arg Pro Phe Asn Ile Gly Ile Asn Asn Gln Gln Leu Ser Val Leu Asp  
370 375 380

Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val  
385 390 395 400

Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln  
405 410 415

Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His  
 420 425 430

Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile  
 435 440 445

Arg Ala Pro Met Phe Ser Trp Thr His Arg Ser Ala Thr Pro Thr Asn  
 450 455 460

Thr Ile Asp Pro Glu Arg Ile Thr Gln Ile Pro Leu Val Lys Ala His  
 465 470 475 480

Thr Leu Gln Ser Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly  
 485 490 495

Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile  
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Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg  
 515 520 525

Tyr Ala Ser Thr Thr Asn Leu Arg Ile Tyr Val Thr Val Ala Gly Glu  
 530 535 540

Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro  
 545 550 555 560

Leu Thr Phe Gln Ser Phe Ser Tyr Ala Thr Ile Asn Thr Ala Phe Thr  
 565 570 575

Phe Pro Met Ser Gln Ser Ser Phe Thr Val Gly Ala Asp Thr Phe Ser  
 580 585 590

Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr  
 595 600 605

Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val  
 610 615 620

Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val  
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Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser  
645 650 655

Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys  
660 665 670

His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn  
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Phe Lys Gly Ile Asn Arg Gln Leu Asp Arg Gly Trp Arg Gly Ser Thr  
690 695 700

Asp Ile Thr Ile Gln Arg Gly Asp Asp Val Phe Lys Glu Asn Tyr Val  
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Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln  
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Lys Ile Asp Glu Ser Lys Leu Lys Ala Phe Thr Arg Tyr Gln Leu Arg  
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Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr  
755 760 765

Asn Ala Lys His Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp  
770 775 780

Pro Leu Ser Ala Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg  
785 790 795 800

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg  
805 810 815

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile  
820 825 830

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile  
835 840 845

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850 855 860

Phe Leu Glu Glu Lys Pro Leu Val Gly Glu Ala Leu Ala Arg Val Lys  
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Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Glu Trp Glu  
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Thr Asn Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe  
 900 905 910

Val Asn Ser Gln Tyr Asp Gln Leu Gln Ala Asp Thr Asn Ile Ala Met  
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Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu  
 930 935 940

Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu  
 945 950 955 960

Leu Glu Gly Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn  
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Val Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val  
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Lys Gly His Val Asp Val Glu Glu Gln Asn Asn Gln Arg Ser Val Leu  
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Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn  
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Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu Glu Ile Tyr  
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Pro Asn Asn Thr Val Thr Cys Asn Asp Tyr Thr Val Asn Gln Glu  
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Glu Tyr Gly Gly Ala Tyr Thr Ser Arg Asn Arg Gly Tyr Asn Glu  
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Ala Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys  
 1100 1105 1110

Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Phe Asn Arg  
 1115 1120 1125

Gly Tyr Arg Asp Tyr Thr Pro Leu Pro Val Gly Tyr Val Thr Lys  
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Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile  
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Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu Leu  
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Leu Met Glu Glu  
 1175

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 1 5 10 15

agt aac cct gaa gta gaa gta tta ggt gga gaa aga ata gaa act ggt 96  
 Ser Asn Pro Glu Val Glu Val Leu Gly Gly Glu Arg Ile Glu Thr Gly  
 20 25 30

tac acc cca atc gat att tcc ttg tcg cta acg caa ttt ctt ttg agt 144

Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser	
35 40 45	
gaa ttt gtt ccc ggt gct gga ttt gtg tta gga cta gtt gat ata ata	192
Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile	
50 55 60	
tgg gga att ttt ggt ccc tct caa tgg gac gca ttt ctt gta caa att	240
Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile	
65 70 75 80	
gaa cag tta att aac caa aga ata gaa gaa ttc gct agg aac caa gcc	288
Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala	
85 90 95	
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Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu	
100 105 110	
tct ttt aga gag tgg gaa gca gat cct act aat cca gca tta aga gaa	384
Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu	
115 120 125	
gag atg cgt att caa ttc aat gac atg aac agt gcc ctt aca acc gct	432
Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala	
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Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val	
145 150 155 160	
tat gtt caa gct gca aat tta cat tta tca gtt ttg aga gat gtt tca	528
Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser	
165 170 175	
gtg ttt gga caa agg tgg gga ttt gat gcc gcg act atc aat agt cgt	576
Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg	
180 185 190	
tat aat gat tta act agg ctt att ggc aac tat aca gat tat gct gta	624
Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp Tyr Ala Val	
195 200 205	
cgc tgg tac aat acg gga tta gaa cgt gta tgg gga ccg gat tct aga	672
Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg	
210 215 220	
gat tgg gta agg tat aat caa ttt aga aga gaa tta aca cta act gta	720
Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val	
225 230 235 240	
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Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro	
245 250 255	

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ggg aca gaa ttt gct tat gga acc tcc tca aat ttg cca tcc gct gta Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val 385 390 395 400	1200
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aat aac aac gtg cca cct agg caa gga ttt agt cat cga tta agc cat Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His 420 425 430	1296
gtt tca atg ttt cgt tca ggc ttt agt aat agt agt gta agt ata ata Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile 435 440 445	1344
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aat gcg ctg ttt act tct ata aac caa ata ggg ata aaa aca gat gtg Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val 625 630 635 640	1920
acg gat tat cat att gat caa gta tcc aat tta gtg gat tgt tta tca Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser 645 650 655	1968
gat gaa ttt tgt ctg gat gaa aag cga gaa ttg tcc gag aaa gtc aaa Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys 660 665 670	2016
cat gcg aag cga ctc agt gat gag cgg aat tta ctt caa gat cca aac His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn 675 680 685	2064

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aca cta cca ggt acc ttt gat gag tgc tat cca aca tat ttg tat caa Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln 725 730 735	2208
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ggg tat atc gaa gat agt caa gac tta gaa atc tat tta att cgc tac Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr 755 760 765	2304
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ccg ctt tca gcc caa agt cca atc gga aag tgt gga gag ccg aat cga Pro Leu Ser Ala Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg 785 790 795 800	2400
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cca aat aac acg gta acg tgt aat gat tat act gta aat caa gaa Pro Asn Asn Thr Val Thr Cys Asn Asp Tyr Thr Val Asn Gln Glu 1070 1075 1080	3249
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tcg tat	aca gat	gga cga	aga	gag aat	cct tgt	gaa	ttt aac	aga	3384
Ser Tyr	Thr Asp	Gly Arg	Arg	Glu Asn	Pro Cys	Glu	Phe Asn	Arg	
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Gly Tyr	Arg Asp	Tyr Thr	Pro	Leu Pro	Val Gly	Tyr	Val Thr	Lys	
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gaa tta	gaa tac	ttc cca	gaa	acc gat	aag gta	tgg	att gag	att	3474
Glu Leu	Glu Tyr	Phe Pro	Glu	Thr Asp	Lys Val	Trp	Ile Glu	Ile	
1145			1150			1155			
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Gly Glu	Thr Glu	Gly Thr	Phe	Ile Val	Asp Ser	Val	Glu Leu	Leu	
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Leu Met	Glu Glu								
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Tyr	Thr	Pro	Ile	Asp	Ile	Ser	Leu	Ser	Leu	Thr	Gln	Phe	Leu	Leu	Ser
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Glu	Phe	Val	Pro	Gly	Ala	Gly	Phe	Val	Leu	Gly	Leu	Val	Asp	Ile	Ile
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Trp	Gly	Ile	Phe	Gly	Pro	Ser	Gln	Trp	Asp	Ala	Phe	Leu	Val	Gln	Ile
65					70					75				80	

Glu	Gln	Leu	Ile	Asn	Gln	Arg	Ile	Glu	Glu	Phe	Ala	Arg	Asn	Gln	Ala
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Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
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Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
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Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala  
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Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val  
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Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser  
165 170 175

Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg  
180 185 190

Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp Tyr Ala Val  
195 200 205

Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg  
210 215 220

Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val  
225 230 235 240

Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro  
245 250 255

Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val  
260 265 270

Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu  
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Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr  
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Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln  
305 310 315 320

Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro  
 325 330 335

Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala  
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Gln Leu Gly Gln Gly Val Tyr Arg Thr Leu Ser Ser Thr Leu Tyr Arg  
 355 360 365

Arg Pro Phe Asn Ile Gly Ile Asn Asn Gln Gln Leu Ser Val Leu Asp  
 370 375 380

Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val  
 385 390 395 400

Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln  
 405 410 415

Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His  
 420 425 430

Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile  
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Arg Ala Pro Met Phe Ser Trp Thr His Arg Ser Ala Thr Pro Thr Asn  
 450 455 460

Thr Ile Asp Pro Glu Arg Ile Thr Gln Ile Pro Leu Val Lys Ala His  
 465 470 475 480

Thr Leu Gln Ser Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly  
 485 490 495

Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile  
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Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg  
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Tyr Ala Ser Thr Thr Asn Leu Arg Ile Tyr Val Thr Val Ala Gly Glu  
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Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro  
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Leu Thr Phe Gln Ser Phe Ser Tyr Ala Thr Ile Asn Thr Ala Phe Thr  
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Phe Pro Met Ser Gln Ser Ser Phe Thr Val Gly Ala Asp Thr Phe Ser  
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Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr  
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Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val  
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Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val  
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Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser  
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Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys  
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His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn  
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Phe Lys Gly Ile Asn Arg Gln Leu Asp Arg Gly Trp Arg Gly Ser Thr  
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Asp Ile Thr Ile Gln Arg Gly Asp Asp Val Phe Lys Glu Asn Tyr Val  
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Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln  
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Lys Ile Asp Glu Ser Lys Leu Lys Ala Phe Thr Arg Tyr Gln Leu Arg  
 740 745 750

Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr  
755 760 765

Asn Ala Lys His Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp  
770 775 780

Pro Leu Ser Ala Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg  
785 790 795 800

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg  
805 810 815

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile  
820 825 830

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile  
835 840 845

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu  
850 855 860

Phe Leu Glu Glu Lys Pro Leu Val Gly Glu Ala Leu Ala Arg Val Lys  
865 870 875 880

Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Glu Trp Glu  
885 890 895

Thr Asn Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe  
900 905 910

Val Asn Ser Gln Tyr Asp Gln Leu Gln Ala Asp Thr Asn Ile Ala Met  
915 920 925

Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu  
930 935 940

Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu  
945 950 955 960

Leu Glu Gly Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn  
965 970 975



Val Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val  
 980 985 990

Lys Gly His Val Asp Val Glu Glu Gln Asn Asn Gln Arg Ser Val Leu  
 995 1000 1005

Val Val Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val  
 1010 1015 1020

Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu  
 1025 1030 1035

Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn  
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Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu Glu Ile Tyr  
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Pro Asn Asn Thr Val Thr Cys Asn Asp Tyr Thr Val Asn Gln Glu  
 1070 1075 1080

Glu Tyr Gly Gly Ala Tyr Thr Ser Arg Asn Arg Gly Tyr Asn Glu  
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Ala Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys  
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Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Phe Asn Arg  
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Gly Tyr Arg Asp Tyr Thr Pro Leu Pro Val Gly Tyr Val Thr Lys  
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Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile  
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 Ser Asn Pro Glu Val Glu Val Leu Gly Gly Glu Arg Ile Glu Thr Gly  
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 85 90 95  
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cgc tgg tac aat acg gga tta gaa cgt gta tgg gga ccg gat tct aga Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg 210 215 220	672
gat tgg gta agg tat aat caa ttt aga aga gaa tta aca cta act gta Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val 225 230 235 240	720
tta gat atc gtt gct ctg ttc ccg aat tat gat agt aga aga tat cca Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro 245 250 255	768
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atc tat acg gat gct cat agg ggt tat tat tat tgg tca ggg cat caa Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln 305 310 315 320	960
ata atg gct tct cct gta ggg ttt tcg ggg cca gaa ttc act ttt ccg Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro 325 330 335	1008
cta tat gga act atg gga aat gca gct cca caa caa cgt att gtt gct Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala 340 345 350	1056
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ggg aca gaa ttt gct tat gga acc tcc tca aat ttg cca tcc gct gta Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val 385 390 395 400	1200
tac aga aaa agc gga acg gta gat tcg ctg gat gaa ata ccg cca cag Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln 405 410 415	1248
aat aac aac gtg cca cct agg caa gga ttt agt cat cga tta agc cat Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His 420 425 430	1296
gtt tca atg ttt cgt tca ggc ttt agt aat agt agt gta agt ata ata Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile 435 440 445	1344
aga gct cca atg ttt tct tgg acg cac cgt agt gca acc cct aca aat Arg Ala Pro Met Phe Ser Trp Thr His Arg Ser Ala Thr Pro Thr Asn 450 455 460	1392
aca att gat ccg gag agg att act caa ata cca ttg gta aaa gca cat Thr Ile Asp Pro Glu Arg Ile Thr Gln Ile Pro Leu Val Lys Ala His 465 470 475 480	1440
aca ctt cag tca ggt act act gtt gta aga ggg ccc ggg ttt acg gga Thr Leu Gln Ser Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly 485 490 495	1488
gga gat att ctt cga cga aca agt gga gga cca ttt gct tat act att Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile 500 505 510	1536
gtt aat ata aat ggg caa tta ccc caa agg tat cgt gca aga ata cgc Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg 515 520 525	1584
tat gcc tct act aca aat cta aga att tac gta acg gtt gca ggt gaa Tyr Ala Ser Thr Thr Asn Leu Arg Ile Tyr Val Thr Val Ala Gly Glu 530 535 540	1632
cgg att ttt gct ggt caa ttt aac aaa aca atg gat acc ggt gac cca Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro 545 550 555 560	1680
tta aca ttc caa tct ttt agt tac gca act att aat aca gct ttt aca Leu Thr Phe Gln Ser Phe Ser Tyr Ala Thr Ile Asn Thr Ala Phe Thr 565 570 575	1728
ttc cca atg agc cag agt agt ttc aca gta ggt gct gat act ttt agt Phe Pro Met Ser Gln Ser Ser Phe Thr Val Gly Ala Asp Thr Phe Ser 580 585 590	1776

tca ggg aat gaa gtt tat ata gac aga ttt gaa ttg att cca gtt act	1824
Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr	
595 600 605	
gca aca ttt gaa gca gaa tat gat tta gaa aga gca caa aag gcg gtg	1872
Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val	
610 615 620	
aat gcg ctg ttt act tct ata aac caa ata ggg ata aaa aca gat gtg	1920
Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val	
625 630 635 640	
acg gat tat cat att gat caa gta tcc aat tta gtg gat tgt tta tca	1968
Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser	
645 650 655	
gat gaa ttt tgt ctg gat gaa aag cga gaa ttg tcc gag aaa gtc aaa	2016
Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys	
660 665 670	
cat gcg aag cga ctc agt gat gag cgg aat tta ctt caa gat cca aac	2064
His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn	
675 680 685	
ttc aaa ggc atc aat agg caa cta gac cgt ggt tgg aga gga agt acg	2112
Phe Lys Gly Ile Asn Arg Gln Leu Asp Arg Gly Trp Arg Gly Ser Thr	
690 695 700	
gat att acc atc caa aga gga gat gac gta ttc aaa gaa aat tat gtc	2160
Asp Ile Thr Ile Gln Arg Gly Asp Asp Val Phe Lys Glu Asn Tyr Val	
705 710 715 720	
aca cta cca ggt acc ttt gat gag tgc tat cca aca tat ttg tat caa	2208
Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln	
725 730 735	
aaa atc gat gaa tca aaa tta aaa gcc ttt acc cgt tat caa tta aga	2256
Lys Ile Asp Glu Ser Lys Leu Lys Ala Phe Thr Arg Tyr Gln Leu Arg	
740 745 750	
ggg tat atc gaa gat agt caa gac tta gaa atc tat tta att cgc tac	2304
Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr	
755 760 765	
aat gca aaa cat gaa aca gta aat gtg cca ggt acg ggt tcc tta tgg	2352
Asn Ala Lys His Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp	
770 775 780	
ccg ctt tca gcc caa agt cca atc gga aag tgt gga gag ccg aat cga	2400
Pro Leu Ser Ala Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg	
785 790 795 800	

tgc gcg cca cac ctt gaa tgg aat cct gac tta gat tgt tcg tgt agg Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg 805 810 815	2448
gat gga gaa aag tgt gcc cat cat tcg cat cat ttc tcc tta gac att Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile 820 825 830	2496
gat gta gga tgt aca gac tta aat gag gac cta ggt gta tgg gtg atc Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile 835 840 845	2544
ttt aag att aag acg caa gat ggg cac gca aga cta ggg aat cta gag Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu 850 855 860	2592
ttt ctc gaa gag aaa cca tta gta gga gaa gcg cta gct cgt gtg aaa Phe Leu Glu Glu Lys Pro Leu Val Gly Glu Ala Leu Ala Arg Val Lys 865 870 875 880	2640
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att cat gcg gca gat aaa cgt gtt cat agc att cga gaa gct tat ctg Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu 930 935 940	2832
cct gag ctg tct gtg att ccg ggt gtc aat gcg gct att ttt gaa gaa Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu 945 950 955 960	2880
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gtc att aaa aat ggt gat ttt aat aat ggc tta tcc tgc tgg aac gtg Val Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val 980 985 990	2976
aaa ggg cat gta gat gta gaa gaa caa aac aac caa cgt tcg gtc ctt Lys Gly His Val Asp Val Glu Glu Gln Asn Asn Gln Arg Ser Val Leu 995 1000 1005	3024
gtt gtt ccg gaa tgg gaa gca gaa gtg tca caa gaa gtt cgt gtc Val Val Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val 1010 1015 1020	3069

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Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu	
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gga tat gga gaa ggt tgc gta acc att cat gag atc gag aac aat	3159
Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn	
1040 1045 1050	
aca gac gaa ctg aag ttt agc aac tgc gta gaa gag gaa atc tat	3204
Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu Glu Ile Tyr	
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cca aat aac acg gta acg tgt aat gat tat act gta aat caa gaa	3249
Pro Asn Asn Thr Val Thr Cys Asn Asp Tyr Thr Val Asn Gln Glu	
1070 1075 1080	
gaa tac gga ggt gcg tac act tct cgt aat cga gga tat aac gaa	3294
Glu Tyr Gly Gly Ala Tyr Thr Ser Arg Asn Arg Gly Tyr Asn Glu	
1085 1090 1095	
gct cct tcc gta cca gct gat tat gcg tca gtc tat gaa gaa aaa	3339
Ala Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys	
1100 1105 1110	
tcg tat aca gat gga cga aga gag aat cct tgt gaa ttt aac aga	3384
Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Phe Asn Arg	
1115 1120 1125	
ggg tat agg gat tac acg cca cta cca gtt ggt tat gtg aca aaa	3429
Gly Tyr Arg Asp Tyr Thr Pro Leu Pro Val Gly Tyr Val Thr Lys	
1130 1135 1140	
gaa tta gaa tac ttc cca gaa acc gat aag gta tgg att gag att	3474
Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile	
1145 1150 1155	
gga gaa acg gaa gga aca ttt atc gtg gac agc gtg gaa tta ctc	3519
Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu Leu	
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ctt atg gag gaa	3531
Leu Met Glu Glu	
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Ser Asn Pro Glu Val Glu Val Leu Gly Gly Glu Arg Ile Glu Thr Gly  
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Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser  
 35 40 45

Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile  
 50 55 60

Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile  
 65 70 75 80

Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala  
 85 90 95

Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
 100 105 110

Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
 115 120 125

Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala  
 130 135 140

Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val  
 145 150 155 160

Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser  
 165 170 175

Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg  
 180 185 190

Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp Tyr Ala Val  
 195 200 205

Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg  
 210 215 220



Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val  
 225 230 235 240

Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro  
 245 250 255

Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val  
 260 265 270

Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu  
 275 280 285

Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr  
 290 295 300

Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln  
 305 310 315 320

Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro  
 325 330 335

Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala  
 340 345 350

Gln Leu Gly Gln Gly Val Tyr Arg Thr Leu Ser Ser Thr Leu Tyr Arg  
 355 360 365

Arg Pro Phe Asn Ile Gly Ile Asn Asn Gln Gln Leu Ser Val Leu Asp  
 370 375 380

Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val  
 385 390 395 400

Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln  
 405 410 415

Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His  
 420 425 430

Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile  
 435 440 445

Arg Ala Pro Met Phe Ser Trp Thr His Arg Ser Ala Thr Pro Thr Asn  
 450 455 460

Thr Ile Asp Pro Glu Arg Ile Thr Gln Ile Pro Leu Val Lys Ala His  
 465 470 475 480

Thr Leu Gln Ser Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly  
 485 490 495

Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile  
 500 505 510

Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg  
 515 520 525

Tyr Ala Ser Thr Thr Asn Leu Arg Ile Tyr Val Thr Val Ala Gly Glu  
 530 535 540

Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro  
 545 550 555 560

Leu Thr Phe Gln Ser Phe Ser Tyr Ala Thr Ile Asn Thr Ala Phe Thr  
 565 570 575

Phe Pro Met Ser Gln Ser Ser Phe Thr Val Gly Ala Asp Thr Phe Ser  
 580 585 590

Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr  
 595 600 605

Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val  
 610 615 620

Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val  
 625 630 635 640

Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser  
 645 650 655

Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys  
660 665 670

His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn  
675 680 685

Phe Lys Gly Ile Asn Arg Gln Leu Asp Arg Gly Trp Arg Gly Ser Thr  
690 695 700

Asp Ile Thr Ile Gln Arg Gly Asp Asp Val Phe Lys Glu Asn Tyr Val  
705 710 715 720

Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln  
725 730 735

Lys Ile Asp Glu Ser Lys Leu Lys Ala Phe Thr Arg Tyr Gln Leu Arg  
740 745 750

Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr  
755 760 765

Asn Ala Lys His Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp  
770 775 780

Pro Leu Ser Ala Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg  
785 790 795 800

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg  
805 810 815

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile  
820 825 830

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile  
835 840 845

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu  
850 855 860

Phe Leu Glu Glu Lys Pro Leu Val Gly Glu Ala Leu Ala Arg Val Lys  
865 870 875 880

Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Glu Trp Glu  
885 890 895

Thr Asn Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe  
900 905 910

Val Asn Ser Gln Tyr Asp Gln Leu Gln Ala Asp Thr Asn Ile Ala Met  
915 920 925

Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu  
930 935 940

Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu  
945 950 955 960

Leu Glu Gly Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn  
965 970 975

Val Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val  
980 985 990

Lys Gly His Val Asp Val Glu Glu Gln Asn Asn Gln Arg Ser Val Leu  
995 1000 1005

Val Val Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val  
1010 1015 1020

Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu  
1025 1030 1035

Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn  
1040 1045 1050

Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu Glu Ile Tyr  
1055 1060 1065

Pro Asn Asn Thr Val Thr Cys Asn Asp Tyr Thr Val Asn Gln Glu  
1070 1075 1080

Glu Tyr Gly Gly Ala Tyr Thr Ser Arg Asn Arg Gly Tyr Asn Glu  
 1085 1090 1095

Ala Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys  
 1100 1105 1110

Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Phe Asn Arg  
 1115 1120 1125

Gly Tyr Arg Asp Tyr Thr Pro Leu Pro Val Gly Tyr Val Thr Lys  
 1130 1135 1140

Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile  
 1145 1150 1155

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Leu Met Glu Glu  
 1175

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ataataagag ctccaatggt

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<400> 18

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<400> 19

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tcatggagag ctcctatggt

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<223> Synthetic Oligonucleotide

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ttaacaagag ctcctatggt

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<223> Synthetic Oligonucleotide

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<400> 22  
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<210> 23  
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<400> 23  
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<210> 24  
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 1 5 10 15

agt aac cct gaa gta gaa gta tta ggt gga gaa aga ata gaa act ggt Ser Asn Pro Glu Val Glu Val Leu Gly Gly Glu Arg Ile Glu Thr Gly 20 25 30	96
tac acc cca atc gat att tcc ttg tcg cta acg caa ttt ctt ttg agt Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser 35 40 45	144
gaa ttt gtt ccc ggt gct gga ttt gtg tta gga cta gtt gat ata ata Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile 50 55 60	192
tgg gga att ttt ggt ccc tct caa tgg gac gca ttt ctt gta caa att Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile 65 70 75 80	240
gaa cag tta att aac caa aga ata gaa gaa ttc gct agg aac caa gcc Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala 85 90 95	288
att tct aga tta gaa gga cta agc aat ctt tat caa att tac gca gaa Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu 100 105 110	336
tct ttt aga gag tgg gaa gca gat cct act aat cca gca tta aga gaa Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu 115 120 125	384
gag atg cgt att caa ttc aat gac atg aac agt gcc ctt aca acc gct Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala 130 135 140	432
att cct ctt ttt gca gtt caa aat tat caa gtt cct ctt tta tca gta Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val 145 150 155 160	480
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gtg ttt gga caa agg tgg gga ttt gat gcc gcg act atc aat agt cgt Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg 180 185 190	576
tat aat gat tta act agg ctt att ggc aac tat aca gat cat gct gta Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp His Ala Val 195 200 205	624
cgc tgg tac aat acg gga tta gag cgt gta tgg gga ccg gat tct aga Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg 210 215 220	672



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225 230 235 240	
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Leu Asp Ile Val Ser Leu Phe Pro Asn Tyr Asp Ser Arg Thr Tyr Pro	
245 250 255	
att cga aca gtt tcc caa tta aca aga gaa att tat aca aac cca gta	816
Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val	
260 265 270	
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Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu	
275 280 285	
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Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr	
290 295 300	
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Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln	
305 310 315 320	
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Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro	
325 330 335	
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Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala	
340 345 350	
caa cta ggt cag ggc gtg tat aga aca tta tcg tcc act tta tat aga	1104
Gln Leu Gly Gln Gly Val Tyr Arg Thr Leu Ser Ser Thr Leu Tyr Arg	
355 360 365	
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Arg Pro Phe Asn Ile Gly Ile Asn Asn Gln Gln Leu Ser Val Leu Asp	
370 375 380	
ggg aca gaa ttt gct tat gga acc tcc tca aat ttg cca tcc gct gta	1200
Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val	
385 390 395 400	
tac aga aaa agc gga acg gta gat tcg ctg gat gaa ata ccg cca cag	1248
Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln	
405 410 415	
aat aac aac gtg cca cct agg caa gga ttt agt cat cga tta agc cat	1296
Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His	
420 425 430	
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Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile	
435 440 445	

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aca ctt cag tca ggt act act gtt gta aga ggg ccc ggg ttt acg gga Thr Leu Gln Ser Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly 485 490 495	1488
gga gat att ctt cga cga aca agt gga gga cca ttt gct tat act att Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile 500 505 510	1536
gtt aat ata aat ggg caa tta ccc caa agg tat cgt gca aga ata cgc Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg 515 520 525	1584
tat gcc tct act aca aat cta aga att tac gta acg gtt gca ggt gaa Tyr Ala Ser Thr Thr Asn Leu Arg Ile Tyr Val Thr Val Ala Gly Glu 530 535 540	1632
cgg att ttt gct ggt caa ttt aac aaa aca atg gat acc ggt gac cca Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro 545 550 555 560	1680
tta aca ttc caa tct ttt agt tac gca act att aat aca gct ttt aca Leu Thr Phe Gln Ser Phe Ser Tyr Ala Thr Ile Asn Thr Ala Phe Thr 565 570 575	1728
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tca ggg aat gaa gtt tat ata gac aga ttt gaa ttg att cca gtt act Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr 595 600 605	1824
gca aca ttt gaa gca gaa tat gat tta gaa aga gca caa aag gcg gtg Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val 610 615 620	1872
aat gcg ctg ttt act tct ata aac caa ata ggg ata aaa aca gat gtg Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val 625 630 635 640	1920
acg gat tat cat att gat caa gta tcc aat tta gtg gat tgt tta tca Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser 645 650 655	1968
gat gaa ttt tgt ctg gat gaa aag cga gaa ttg tcc gag aaa gtc aaa Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys 660 665 670	2016

cat gcg aag cga ctc agt gat gag cgg aat tta ctt caa gat cca aac His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn 675 680 685	2064
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gta aac tct caa tat gat caa tta caa gcg gat acg aat att gcc atg	2784
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att cat gcg gca gat aaa cgt gtt cat agc att cga gaa gct tat ctg	2832
Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu	
930 935 940	
cct gag ctg tct gtg att ccg ggt gtc aat gcg gct att ttt gaa gaa	2880
Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu	
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Leu Glu Gly Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn	
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980 985 990	
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Lys Gly His Val Asp Val Glu Glu Gln Asn Asn Gln Arg Ser Val Leu	
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Val Val Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val	
1010 1015 1020	
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Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu	
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gaa tac gga ggt gcg tac act tct cgt aat cga gga tat aac gaa	3294
Glu Tyr Gly Gly Ala Tyr Thr Ser Arg Asn Arg Gly Tyr Asn Glu	
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Ala Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys	
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Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Phe Asn Arg	
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Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser	
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Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile	
50 55 60	
Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile	
65 70 75 80	

Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala  
85 90 95

Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
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Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
115 120 125

Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala  
130 135 140

Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val  
145 150 155 160

Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser  
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Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg  
180 185 190

Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp His Ala Val  
195 200 205

Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg  
210 215 220

Asp Trp Ile Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val  
225 230 235 240

Leu Asp Ile Val Ser Leu Phe Pro Asn Tyr Asp Ser Arg Thr Tyr Pro  
245 250 255

Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val  
260 265 270

Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu  
275 280 285

Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr  
290 295 300

Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln  
 305 310 315 320

Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro  
 325 330 335

Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala  
 340 345 350

Gln Leu Gly Gln Gly Val Tyr Arg Thr Leu Ser Ser Thr Leu Tyr Arg  
 355 360 365

Arg Pro Phe Asn Ile Gly Ile Asn Asn Gln Gln Leu Ser Val Leu Asp  
 370 375 380

Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val  
 385 390 395 400

Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln  
 405 410 415

Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His  
 420 425 430

Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile  
 435 440 445

Arg Ala Pro Met Phe Ser Trp Thr His Arg Ser Ala Thr Pro Thr Asn  
 450 455 460

Thr Ile Asp Pro Glu Arg Ile Thr Gln Ile Pro Leu Val Lys Ala His  
 465 470 475 480

Thr Leu Gln Ser Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly  
 485 490 495

Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile  
 500 505 510

Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg  
515 520 525

Tyr Ala Ser Thr Thr Asn Leu Arg Ile Tyr Val Thr Val Ala Gly Glu  
530 535 540

Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro  
545 550 555 560

Leu Thr Phe Gln Ser Phe Ser Tyr Ala Thr Ile Asn Thr Ala Phe Thr  
565 570 575

Phe Pro Met Ser Gln Ser Ser Phe Thr Val Gly Ala Asp Thr Phe Ser  
580 585 590

Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr  
595 600 605

Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val  
610 615 620

Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val  
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Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser  
645 650 655

Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys  
660 665 670

His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn  
675 680 685

Phe Lys Gly Ile Asn Arg Gln Leu Asp Arg Gly Trp Arg Gly Ser Thr  
690 695 700

Asp Ile Thr Ile Gln Arg Gly Asp Asp Val Phe Lys Glu Asn Tyr Val  
705 710 715 720

Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln  
725 730 735



Lys Ile Asp Glu Ser Lys Leu Lys Ala Phe Thr Arg Tyr Gln Leu Arg  
740 745 750

Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr  
755 760 765

Asn Ala Lys His Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp  
770 775 780

Pro Leu Ser Ala Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg  
785 790 795 800

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg  
805 810 815

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile  
820 825 830

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile  
835 840 845

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu  
850 855 860

Phe Leu Glu Glu Lys Pro Leu Val Gly Glu Ala Leu Ala Arg Val Lys  
865 870 875 880

Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Glu Trp Glu  
885 890 895

Thr Asn Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe  
900 905 910

Val Asn Ser Gln Tyr Asp Gln Leu Gln Ala Asp Thr Asn Ile Ala Met  
915 920 925

Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu  
930 935 940

Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu  
945 950 955 960

Leu Glu Gly Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn  
965 970 975

Val Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val  
980 985 990

Lys Gly His Val Asp Val Glu Glu Gln Asn Asn Gln Arg Ser Val Leu  
995 1000 1005

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Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu  
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Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn  
1040 1045 1050

Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu Glu Ile Tyr  
1055 1060 1065

Pro Asn Asn Thr Val Thr Cys Asn Asp Tyr Thr Val Asn Gln Glu  
1070 1075 1080

Glu Tyr Gly Gly Ala Tyr Thr Ser Arg Asn Arg Gly Tyr Asn Glu  
1085 1090 1095

Ala Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys  
1100 1105 1110

Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Phe Asn Arg  
1115 1120 1125

Gly Tyr Arg Asp Tyr Thr Pro Leu Pro Val Gly Tyr Val Thr Lys  
1130 1135 1140

Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile  
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 Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser  
 35 40 45  
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 Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile  
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 Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile  
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 Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala  
 85 90 95  
 att tct aga tta gaa gga cta agc aat ctt tat caa att tac gca gaa 336  
 Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
 100 105 110  
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 Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
 115 120 125

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ggg tat atc gaa gat agt caa gac tta gaa atc tat tta att cgc tac Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr 755 760 765	2304
aat gca aaa cat gaa aca gta aat gtg cca ggt acg ggt tcc tta tgg Asn Ala Lys His Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp 770 775 780	2352

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tgc gcg cca cac ctt gaa tgg aat cct gac tta gat tgt tcg tgt agg Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg 805 810 815	2448
gat gga gaa aag tgt gcc cat cat tcg cat cat ttc tcc tta gac att Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile 820 825 830	2496
gat gta gga tgt aca gac tta aat gag gac cta ggt gta tgg gtg atc Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile 835 840 845	2544
ttt aag att aag acg caa gat ggg cac gca aga cta ggg aat cta gag Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu 850 855 860	2592
ttt ctc gaa gag aaa cca tta gta gga gaa gcg cta gct cgt gtg aaa Phe Leu Glu Glu Lys Pro Leu Val Gly Glu Ala Leu Ala Arg Val Lys 865 870 875 880	2640
aga gcg gag aaa aaa tgg aga gac aaa cgt gaa aaa ttg gaa tgg gaa Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Glu Trp Glu 885 890 895	2688
aca aat atc gtt tat aaa gag gca aaa gaa tct gta gat gct tta ttt Thr Asn Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe 900 905 910	2736
gta aac tct caa tat gat caa tta caa gcg gat acg aat att gcc atg Val Asn Ser Gln Tyr Asp Gln Leu Gln Ala Asp Thr Asn Ile Ala Met 915 920 925	2784
att cat gcg gca gat aaa cgt gtt cat agc att cga gaa gct tat ctg Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu 930 935 940	2832
cct gag ctg tct gtg att ccg ggt gtc aat gcg gct att ttt gaa gaa Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu 945 950 955 960	2880
tta gaa ggg cgt att ttc act gca ttc tcc cta tat gat gcg aga aat Leu Glu Gly Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn 965 970 975	2928
gtc att aaa aat ggt gat ttt aat aat ggc tta tcc tgc tgg aac gtg Val Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val 980 985 990	2976

aaa ggg cat gta gat gta gaa gaa	caa aac aac caa cgt	tcg gtc ctt	3024
Lys Gly His Val Asp Val Glu Glu	Gln Asn Asn Gln Arg	Ser Val Leu	
995	1000	1005	
gtt gtt ccg gaa tgg gaa gca	gaa gtg tca caa gaa	gtt cgt gtc	3069
Val Val Pro Glu Trp Glu Ala	Glu Val Ser Gln Glu	Val Arg Val	
1010	1015	1020	
tgt ccg ggt cgt ggc tat atc	ctt cgt gtc aca gcg	tac aag gag	3114
Cys Pro Gly Arg Gly Tyr Ile	Leu Arg Val Thr Ala	Tyr Lys Glu	
1025	1030	1035	
gga tat gga gaa ggt tgc gta	acc att cat gag atc	gag aac aat	3159
Gly Tyr Gly Glu Gly Cys Val	Thr Ile His Glu Ile	Glu Asn Asn	
1040	1045	1050	
aca gac gaa ctg aag ttt agc	aac tgc gta gaa gag	gaa atc tat	3204
Thr Asp Glu Leu Lys Phe Ser	Asn Cys Val Glu Glu	Glu Ile Tyr	
1055	1060	1065	
cca aat aac acg gta acg tgt	aat gat tat act gta	aat caa gaa	3249
Pro Asn Asn Thr Val Thr Cys	Asn Asp Tyr Thr Val	Asn Gln Glu	
1070	1075	1080	
gaa tac gga ggt gcg tac act	tct cgt aat cga gga	tat aac gaa	3294
Glu Tyr Gly Gly Ala Tyr Thr	Ser Arg Asn Arg Gly	Tyr Asn Glu	
1085	1090	1095	
gct cct tcc gta cca gct gat	tat gcg tca gtc tat	gaa gaa aaa	3339
Ala Pro Ser Val Pro Ala Asp	Tyr Ala Ser Val Tyr	Glu Glu Lys	
1100	1105	1110	
tcg tat aca gat gga cga aga	gag aat cct tgt gaa	ttt aac aga	3384
Ser Tyr Thr Asp Gly Arg Arg	Glu Asn Pro Cys Glu	Phe Asn Arg	
1115	1120	1125	
ggg tat agg gat tac acg cca	cta cca gtt ggt tat	gtg aca aaa	3429
Gly Tyr Arg Asp Tyr Thr Pro	Leu Pro Val Gly Tyr	Val Thr Lys	
1130	1135	1140	
gaa tta gaa tac ttc cca gaa	acc gat aag gta tgg	att gag att	3474
Glu Leu Glu Tyr Phe Pro Glu	Thr Asp Lys Val Trp	Ile Glu Ile	
1145	1150	1155	
gga gaa acg gaa gga aca ttt	atc gtg gac agc gtg	gaa tta ctc	3519
Gly Glu Thr Glu Gly Thr Phe	Ile Val Asp Ser Val	Glu Leu Leu	
1160	1165	1170	
ctt atg gag gaa tag			3534
Leu Met Glu Glu			
1175			



<210> 28  
 <211> 1177  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> Hybrid Delta-Endotoxin

<400> 28

Met Asp Asn Asn Pro Asn Ile Asn Glu Cys Ile Pro Tyr Asn Cys Leu  
 1 5 10 15

Ser Asn Pro Glu Val Glu Val Leu Gly Gly Glu Arg Ile Glu Thr Gly  
 20 25 30

Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser  
 35 40 45

Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile  
 50 55 60

Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile  
 65 70 75 80

Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala  
 85 90 95

Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
 100 105 110

Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
 115 120 125

Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala  
 130 135 140

Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val  
 145 150 155 160

Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser  
 165 170 175

Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg  
180 185 190

Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp Tyr Ala Val  
195 200 205

Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg  
210 215 220

Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val  
225 230 235 240

Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro  
245 250 255

Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val  
260 265 270

Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu  
275 280 285

Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr  
290 295 300

Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln  
305 310 315 320

Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro  
325 330 335

Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala  
340 345 350

Gln Leu Gly Gln Gly Val Tyr Arg Thr Leu Ser Ser Thr Leu Tyr Arg  
355 360 365

Arg Pro Phe Asn Ile Gly Ile Asn Asn Gln Gln Leu Ser Val Leu Asp  
370 375 380

Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val  
385 390 395 400

Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln  
 405 410 415

Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His  
 420 425 430

Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile  
 435 440 445

Arg Ala Pro Met Phe Ser Trp Ile His Arg Ser Ala Glu Phe Asn Asn  
 450 455 460

Ile Ile Ala Ser Asp Ser Ile Thr Gln Ile Pro Leu Val Lys Ala His  
 465 470 475 480

Thr Leu Gln Ser Gly Thr Thr Val Val Arg Gly Pro Gly Phe Thr Gly  
 485 490 495

Gly Asp Ile Leu Arg Arg Thr Ser Gly Gly Pro Phe Ala Tyr Thr Ile  
 500 505 510

Val Asn Ile Asn Gly Gln Leu Pro Gln Arg Tyr Arg Ala Arg Ile Arg  
 515 520 525

Tyr Ala Ser Thr Thr Asn Leu Arg Ile Tyr Val Thr Val Ala Gly Glu  
 530 535 540

Arg Ile Phe Ala Gly Gln Phe Asn Lys Thr Met Asp Thr Gly Asp Pro  
 545 550 555 560

Leu Thr Phe Gln Ser Phe Ser Tyr Ala Thr Ile Asn Thr Ala Phe Thr  
 565 570 575

Phe Pro Met Ser Gln Ser Ser Phe Thr Val Gly Ala Asp Thr Phe Ser  
 580 585 590

Ser Gly Asn Glu Val Tyr Ile Asp Arg Phe Glu Leu Ile Pro Val Thr  
 595 600 605

Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Ala Val  
 610 615 620

Asn Ala Leu Phe Thr Ser Ile Asn Gln Ile Gly Ile Lys Thr Asp Val  
 625 630 635 640

Thr Asp Tyr His Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser  
 645 650 655

Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys  
 660 665 670

His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn  
 675 680 685

Phe Lys Gly Ile Asn Arg Gln Leu Asp Arg Gly Trp Arg Gly Ser Thr  
 690 695 700

Asp Ile Thr Ile Gln Arg Gly Asp Asp Val Phe Lys Glu Asn Tyr Val  
 705 710 715 720

Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln  
 725 730 735

Lys Ile Asp Glu Ser Lys Leu Lys Ala Phe Thr Arg Tyr Gln Leu Arg  
 740 745 750

Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr  
 755 760 765

Asn Ala Lys His Glu Thr Val Asn Val Pro Gly Thr Gly Ser Leu Trp  
 770 775 780

Pro Leu Ser Ala Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg  
 785 790 795 800

Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg  
 805 810 815

Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile  
 820 825 830

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile  
835 840 845

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu  
850 855 860

Phe Leu Glu Glu Lys Pro Leu Val Gly Glu Ala Leu Ala Arg Val Lys  
865 870 875 880

Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Lys Leu Glu Trp Glu  
885 890 895

Thr Asn Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe  
900 905 910

Val Asn Ser Gln Tyr Asp Gln Leu Gln Ala Asp Thr Asn Ile Ala Met  
915 920 925

Ile His Ala Ala Asp Lys Arg Val His Ser Ile Arg Glu Ala Tyr Leu  
930 935 940

Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu  
945 950 955 960

Leu Glu Gly Arg Ile Phe Thr Ala Phe Ser Leu Tyr Asp Ala Arg Asn  
965 970 975

Val Ile Lys Asn Gly Asp Phe Asn Asn Gly Leu Ser Cys Trp Asn Val  
980 985 990

Lys Gly His Val Asp Val Glu Glu Gln Asn Asn Gln Arg Ser Val Leu  
995 1000 1005

Val Val Pro Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val  
1010 1015 1020

Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu  
1025 1030 1035

Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu Ile Glu Asn Asn  
1040 1045 1050

Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu Glu Ile Tyr  
1055 1060 1065

Pro Asn Asn Thr Val Thr Cys Asn Asp Tyr Thr Val Asn Gln Glu  
1070 1075 1080

Glu Tyr Gly Gly Ala Tyr Thr Ser Arg Asn Arg Gly Tyr Asn Glu  
1085 1090 1095

Ala Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys  
1100 1105 1110

Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Phe Asn Arg  
1115 1120 1125

Gly Tyr Arg Asp Tyr Thr Pro Leu Pro Val Gly Tyr Val Thr Lys  
1130 1135 1140

Glu Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu Ile  
1145 1150 1155

Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu Leu  
1160 1165 1170

Leu Met Glu Glu  
1175

<210> 29  
<211> 3579  
<212> DNA  
<213> Artificial sequence

<220>  
<223> Hybrid Delta-Endotoxin

<400> 29  
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gtagaagtat taggtggaga aagaatagaa actgggttaca cccaatcga tatttccttg 120  
tcgctaacgc aatttctttt gagtgaattt gttcccggtg ctggatttgt gttaggacta 180  
gttgatataa tatggggaat ttttgggtccc tctcaatggg acgcatttct tgtacaaatt 240  
gaacagttaa ttaaccaaag aatagaagaa ttcgctagga accaagccat ttctagatta 300

gaaggactaa gcaatcttta tcaaatttac gcagaatctt ttagagagtg ggaagcagat	360
cctactaatc cagcattaag agaagagatg cgtattcaat tcaatgacat gaacagtgcc	420
cttacaaccg ctattcctct ttttgagtt caaaattatc aagttcctct tttatcagta	480
tatgttcaag ctgcaaattt acatttatca gttttgagag atgtttcagt gtttggacaa	540
aggtggggat ttgatgccgc gactatcaat agtcgttata atgatttaac taggcttatt	600
ggcaactata cagattatgc tgtacgctgg tacaatacgg gattagaacg tgtatgggga	660
ccggattcta gagattgggt aagggtataat caatttagaa gagaattaac actaactgta	720
ttagatatcg ttgctctgtt cccgaattat gatagtagaa gatatccaat tcgaacagtt	780
tcccaattaa caagagaaat ttatacaaac ccagtattag aaaattttga tggtagtttt	840
cgaggctcgg ctgagggcat agaaagaagt attaggagtc cacatttgat ggatatactt	900
aacagtataa ccatctatac ggatgctcat aggggttatt attattggtc agggcatcaa	960
ataatggctt ctctgtagg gttttcgggg ccagaattca cttttccgct atatggaact	1020
atgggaaatg cagctccaca acaacgtatt gttgctcaac taggtcaggg cgtgtataga	1080
acattatcgt ccactttata tagaagacct tttaatatag ggataaataa tcaacaacta	1140
tctgttcttg acgggacaga atttgcttat ggaacctcct caaatttgcc atccgctgta	1200
tacagaaaaa gcggaacggt agattcgctg gatgaaatac cgccacagaa taacaacgtg	1260
ccacctaggc aaggatttag tcatcgatta agccatgttt caatgtttcg ttcaggcttt	1320
agtaatagta gtgtaagtat aataagagct cctatgttct cttggataca tcgtagtgca	1380
actcttacia atacaattga tccagagaga attaatcaaa tacctttagt gaaaggattt	1440
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cgaagaaata cctttggtga ttttgatatct ctacaagtca atattaattc accaattacc	1560
caaagatacc gtttaagatt tcgttacgct tccagtaggg atgcacgagt tatagtatta	1620
acaggagcgg catccacagg agtgggaggg caagttagt taaatatgcc tcttcagaaa	1680
actatggaaa taggggagaa cttaacatct agaacattta gatataccga ttttagtaat	1740
cctttttcat ttagagctaa tccagatata attgggataa gtgaacaacc tctatttgg	1800
gcaggttcta ttagtagcgg tgaactttat atagataaaa ttgaaattat tctagcagat	1860
gcaacatttg aagcagaatc tgatttagaa agagcacaaa aggcggtgaa tgccctgttt	1920

acttcttcca atcaaactcg gttaaaaacc gatgtgacgg attatcatat tgatcaagta 1980  
 tccaatttag tggattgttt atcagatgaa ttttgtctgg atgaaaagcg agaattgtcc 2040  
 gagaaagtca aacatgcgaa gcgactcagt gatgagcggg atttacttca agatccaaac 2100  
 ttcagaggga tcaatagaca accagaccgt ggctggagag gaagtacaga tattaccatc 2160  
 caaggaggag atgacgtatt caaagagaat tacgtcacac taccgggtac cggtgatgag 2220  
 tgctatccaa cgtatttata tcagaaaata gatgagtcga aattaaaagc ttatacccg 2280  
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 aatgcaaaac acgaaatagt aaatgtgccg ggcacgggtt ccttatggcc gctttcagcc 2400  
 caaagtccaa tcggaaagtg tggagaaccg aatcgatgcg cgccacacct tgaatggaat 2460  
 cctgatctag attgttcctg cagagacggg gaaaaatgtg cacatcattc ccatcatttc 2520  
 accttgata ttgatgttg atgtacagac ttaaagtagg acttaggtgt atgggtgata 2580  
 ttcaagatta agacgcaaga tggccatgca agactaggga atctagagtt tctcgaagag 2640  
 aaaccattat taggggaagc actagctcgt gtgaaaagag cggagaagaa gtggagagac 2700  
 aaacgagaga aactgcagtt ggaaacaaat attgtttata aagaggcaaa agaactctgta 2760  
 gatgctttat ttgtaaactc tcaatatgat agattacaag tggatacgaa catcgcaatg 2820  
 attcatgcgg cagataaacg cgttcataga atccgggaag cgtatctgcc agagttgtct 2880  
 gtgattccag gtgtcaatgc ggccattttc gaagaattag agggacgtat ttttacagcg 2940  
 tattccttat atgatgcgag aaatgtcatt aaaaatggcg atttcaataa tggcttatta 3000  
 tgctggaacg tgaaagggtca tgtagatgta gaagagcaaa acaaccaccg ttcggtcctt 3060  
 gttatccag aatgggaggc agaagtgtca caagagggtc gtgtctgtcc aggtcgtggc 3120  
 tatatccttc gtgtcacagc atataaagag ggatatggag agggctgcgt aacgatccat 3180  
 gagatcgaag acaatacaga cgaactgaaa ttcagcaact gtgtagaaga ggaagtatat 3240  
 ccaacaaca cagtaacgtg taataattat actgggactc aagaagaata tgagggtacg 3300  
 tacatttctc gtaatcaagg atatgacgaa gcctatggta ataacccttc cgtaccagct 3360  
 gattacgctt cagtctatga agaaaaatcg tatacagatg gacgaagaga gaatccttgt 3420  
 gaatctaaca gaggctatgg ggattacaca ccaactaccg ctggttatgt acaaaggat 3480  
 ttagagtact tcccagagac cgataaggta tggattgaga tcggagaaac agaaggaaca 3540  
 ttcacgtgg atagcgtgga attactcctt atggaggaa 3579



<210> 30  
 <211> 1193  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> Hybrid Delta-Endotoxin

<400> 30

Met Asp Asn Asn Pro Asn Ile Asn Glu Cys Ile Pro Tyr Asn Cys Leu  
 1 5 10 15

Ser Asn Pro Glu Val Glu Val Leu Gly Gly Glu Arg Ile Glu Thr Gly  
 20 25 30

Tyr Thr Pro Ile Asp Ile Ser Leu Ser Leu Thr Gln Phe Leu Leu Ser  
 35 40 45

Glu Phe Val Pro Gly Ala Gly Phe Val Leu Gly Leu Val Asp Ile Ile  
 50 55 60

Trp Gly Ile Phe Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile  
 65 70 75 80

Glu Gln Leu Ile Asn Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala  
 85 90 95

Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Gln Ile Tyr Ala Glu  
 100 105 110

Ser Phe Arg Glu Trp Glu Ala Asp Pro Thr Asn Pro Ala Leu Arg Glu  
 115 120 125

Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Thr Thr Ala  
 130 135 140

Ile Pro Leu Phe Ala Val Gln Asn Tyr Gln Val Pro Leu Leu Ser Val  
 145 150 155 160

Tyr Val Gln Ala Ala Asn Leu His Leu Ser Val Leu Arg Asp Val Ser  
 165 170 175

Val Phe Gly Gln Arg Trp Gly Phe Asp Ala Ala Thr Ile Asn Ser Arg  
180 185 190

Tyr Asn Asp Leu Thr Arg Leu Ile Gly Asn Tyr Thr Asp Tyr Ala Val  
195 200 205

Arg Trp Tyr Asn Thr Gly Leu Glu Arg Val Trp Gly Pro Asp Ser Arg  
210 215 220

Asp Trp Val Arg Tyr Asn Gln Phe Arg Arg Glu Leu Thr Leu Thr Val  
225 230 235 240

Leu Asp Ile Val Ala Leu Phe Pro Asn Tyr Asp Ser Arg Arg Tyr Pro  
245 250 255

Ile Arg Thr Val Ser Gln Leu Thr Arg Glu Ile Tyr Thr Asn Pro Val  
260 265 270

Leu Glu Asn Phe Asp Gly Ser Phe Arg Gly Ser Ala Gln Gly Ile Glu  
275 280 285

Arg Ser Ile Arg Ser Pro His Leu Met Asp Ile Leu Asn Ser Ile Thr  
290 295 300

Ile Tyr Thr Asp Ala His Arg Gly Tyr Tyr Tyr Trp Ser Gly His Gln  
305 310 315 320

Ile Met Ala Ser Pro Val Gly Phe Ser Gly Pro Glu Phe Thr Phe Pro  
325 330 335

Leu Tyr Gly Thr Met Gly Asn Ala Ala Pro Gln Gln Arg Ile Val Ala  
340 345 350

Gln Leu Gly Gln Gly Val Tyr Arg Thr Leu Ser Ser Thr Leu Tyr Arg  
355 360 365

Arg Pro Phe Asn Ile Gly Ile Asn Asn Gln Gln Leu Ser Val Leu Asp  
370 375 380

Gly Thr Glu Phe Ala Tyr Gly Thr Ser Ser Asn Leu Pro Ser Ala Val  
385 390 395 400

Tyr Arg Lys Ser Gly Thr Val Asp Ser Leu Asp Glu Ile Pro Pro Gln  
405 410 415

Asn Asn Asn Val Pro Pro Arg Gln Gly Phe Ser His Arg Leu Ser His  
420 425 430

Val Ser Met Phe Arg Ser Gly Phe Ser Asn Ser Ser Val Ser Ile Ile  
435 440 445

Arg Ala Pro Met Phe Ser Trp Ile His Arg Ser Ala Thr Leu Thr Asn  
450 455 460

Thr Ile Asp Pro Glu Arg Ile Asn Gln Ile Pro Leu Val Lys Gly Phe  
465 470 475 480

Arg Val Trp Gly Gly Thr Ser Val Ile Thr Gly Pro Gly Phe Thr Gly  
485 490 495

Gly Asp Ile Leu Arg Arg Asn Thr Phe Gly Asp Phe Val Ser Leu Gln  
500 505 510

Val Asn Ile Asn Ser Pro Ile Thr Gln Arg Tyr Arg Leu Arg Phe Arg  
515 520 525

Tyr Ala Ser Ser Arg Asp Ala Arg Val Ile Val Leu Thr Gly Ala Ala  
530 535 540

Ser Thr Gly Val Gly Gly Gln Val Ser Val Asn Met Pro Leu Gln Lys  
545 550 555 560

Thr Met Glu Ile Gly Glu Asn Leu Thr Ser Arg Thr Phe Arg Tyr Thr  
565 570 575

Asp Phe Ser Asn Pro Phe Ser Phe Arg Ala Asn Pro Asp Ile Ile Gly  
580 585 590

Ile Ser Glu Gln Pro Leu Phe Gly Ala Gly Ser Ile Ser Ser Gly Glu  
595 600 605

Leu Tyr Ile Asp Lys Ile Glu Ile Ile Leu Ala Asp Ala Thr Phe Glu  
610 615 620

Ala Glu Ser Asp Leu Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe  
625 630 635 640

Thr Ser Ser Asn Gln Ile Gly Leu Lys Thr Asp Val Thr Asp Tyr His  
645 650 655

Ile Asp Gln Val Ser Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys  
660 665 670

Leu Asp Glu Lys Arg Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg  
675 680 685

Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile  
690 695 700

Asn Arg Gln Pro Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile  
705 710 715 720

Gln Gly Gly Asp Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly  
725 730 735

Thr Val Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu  
740 745 750

Ser Lys Leu Lys Ala Tyr Thr Arg Tyr Glu Leu Arg Gly Tyr Ile Glu  
755 760 765

Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His  
770 775 780

Glu Ile Val Asn Val Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Ala  
785 790 795 800

Gln Ser Pro Ile Gly Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His  
805 810 815

Leu Glu Trp Asn Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys  
820 825 830

Cys Ala His His Ser His His Phe Thr Leu Asp Ile Asp Val Gly Cys  
 835 840 845

Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile Phe Lys Ile Lys  
 850 855 860

Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu  
 865 870 875 880

Lys Pro Leu Leu Gly Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys  
 885 890 895

Lys Trp Arg Asp Lys Arg Glu Lys Leu Gln Leu Glu Thr Asn Ile Val  
 900 905 910

Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln  
 915 920 925

Tyr Asp Arg Leu Gln Val Asp Thr Asn Ile Ala Met Ile His Ala Ala  
 930 935 940

Asp Lys Arg Val His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser  
 945 950 955 960

Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu Leu Glu Gly Arg  
 965 970 975

Ile Phe Thr Ala Tyr Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn  
 980 985 990

Gly Asp Phe Asn Asn Gly Leu Leu Cys Trp Asn Val Lys Gly His Val  
 995 1000 1005

Asp Val Glu Glu Gln Asn Asn His Arg Ser Val Leu Val Ile Pro  
 1010 1015 1020

Glu Trp Glu Ala Glu Val Ser Gln Glu Val Arg Val Cys Pro Gly  
 1025 1030 1035

Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu Gly Tyr Gly  
 1040 1045 1050

Glu Gly Cys Val Thr Ile His Glu Ile Glu Asp Asn Thr Asp Glu  
 1055 1060 1065

Leu Lys Phe Ser Asn Cys Val Glu Glu Glu Val Tyr Pro Asn Asn  
 1070 1075 1080

Thr Val Thr Cys Asn Asn Tyr Thr Gly Thr Gln Glu Glu Tyr Glu  
 1085 1090 1095

Gly Thr Tyr Thr Ser Arg Asn Gln Gly Tyr Asp Glu Ala Tyr Gly  
 1100 1105 1110

Asn Asn Pro Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu  
 1115 1120 1125

Lys Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu Ser Asn  
 1130 1135 1140

Arg Gly Tyr Gly Asp Tyr Thr Pro Leu Pro Ala Gly Tyr Val Thr  
 1145 1150 1155

Lys Asp Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu  
 1160 1165 1170

Ile Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu  
 1175 1180 1185

Leu Leu Met Glu Glu  
 1190